

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/726,710	11/30/2000	Takashi Hasegawa	P/1071-1233	1866

2352 7590 11/04/2002

OSTROLENK FABER GERB & SOFFEN
1180 AVENUE OF THE AMERICAS
NEW YORK, NY 100368403

EXAMINER

BETTENDORF, JUSTIN P

ART UNIT	PAPER NUMBER
2817	

DATE MAILED: 11/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/726,710	HASEGAWA, TAKASHI
Examiner	Art Unit	
Justin P. Bettendorf	2817	

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 21 August 2002.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.
- 4) Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-5 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 25 April 2002 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) The translation of the foreign language provisional application has been received.
- 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>11</u> | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 2817

DETAILED ACTION

1. Applicant is advised that the Notice of Allowance mailed is vacated. If the issue fee has already been paid, applicant may request a refund or request that the fee be credited to a deposit account. However, applicant may wait until the application is either found allowable or held abandoned. If allowed, upon receipt of a new Notice of Allowance, applicant may request that the previously submitted issue fee be applied. If abandoned, applicant may request refund or credit to a specified Deposit Account.
2. Prosecution on the merits of this application is reopened on claims 1-5 considered unpatentable for the reasons indicated below:

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 4, and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Ohira JP 07-131209 (cited by the applicant).

The Ohira reference discloses in figures 5 and 6 a non-reciprocal circuit device comprising a plurality of central conductors overlapping and intersecting each other on a magnetic member 6 and a solenoid-shaped inductor 9 having offset terminals that inherently generates a magnetic field perpendicular to the direction of the DC field from permanent (i.e. “DC”) magnet 7 because the field from the solenoid follows the axis of the solenoid. With respect to claim 2, figure 6 shows the capacitor 10 connected in series with the inductor 9

Art Unit: 2817

thereby forming an inherent bandpass filter because a capacitor and inductor connected in series

always forms a bandpass filter centered at the resonant frequency. With respect to claim 4, the Ohira reference discloses the device is for a cell phone (see [0002] of the attached translation). With respect to claim 5, figure 6 shows the solenoid 9 having an axis adjacent to the central plane of the magnetic member (i.e. wherein "adjacent" is understood to mean "nearby").

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda et al. (of record) in view of Ohira (JP 07-131209).

The Maeda et al. reference discloses in figure 5 a non-reciprocal circuit device with overlapping, intersecting central conductors 21-26 on a magnetic member 31 with a DC magnetic field applied perpendicularly thereto (see claim 1 of Maeda et al.). Figure 6 shows a non-reciprocal circuit that includes a bandpass filter of a series inductor 62 and capacitor 61 (with respect to claim 2), and figure 9 shows a low pass filter that includes capacitors 65, 67 on either side of inductor 66 (with respect to claim 3). The reference further ^{discloses} that the inductors may be formed by a coiled wire (i.e. a solenoid - see col. 8, lines 42-43) but does not disclose the coiled wire's orientation.

As noted above, the Ohira reference discloses a non-reciprocal circuit device with a solenoid shaped inductor 9 having offset terminals orientated such that the field generated is

Art Unit: 2817

perpendicular to the magnetic field generated by the permanent magnet 7 with an axis that is adjacent the central plane of the ferrite magnetic member 6.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time of the invention to have substituted the solenoid inductor and orientation thereof of Ohira in place of the generic solenoids of Maeda et al. because, as the Maeda et al. reference is silent on the orientation and specifics of the solenoid inductor, any art-recognized equivalent solenoid inductor would have been usable therewith such as the one disclosed by Ohira.

With respect to claim 4, it should be noted that the use of a non-reciprocal device in a communication device would have been obvious because that use is a conventional use of the non-reciprocal device (see Ohira [0001] and [0002]).

Conclusion

7. Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 8/21/02 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609(B)(2)(i). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

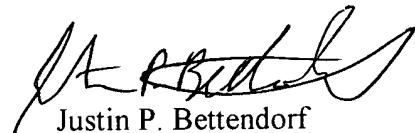
Art Unit: 2817

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Justin P. Bettendorf whose telephone number is (703) 308-2780. The examiner can normally be reached on 6:00-3:30 (M-F, 1st Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert J. Pascal can be reached on (703) 308-4909. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Justin P. Bettendorf
Primary Examiner
Art Unit 2817

jpb
October 21, 2002

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the structure which enabled it to contribute to low-pricing while being able to respond to the miniaturization of parts, and lightweight-ization, attaining wide band-ization of an isolation property in detail about the non-reciprocal circuit element used in VHF, UHF, an SHF band, etc., for example, an isolator.

[0002]

[Description of the Prior Art] Generally, an isolator passes a signal only in the transmission direction, and has the function which prevents transmission to an opposite direction, for example, is adopted as the sending-circuit section of mobile communications devices, such as a cellular phone and a car telephone. Connect the terminator machine R to any one port P3 of the circulator of three ports P1-P3, and this isolator becomes it, as shown in drawing 12. The signal a from the above-mentioned port P1 is transmitted to a port P2, and it has the function which absorbs the reflected wave b which advances from this port P2 with the terminator vessel R, and prevents transmission in a port P1, and has prevented that an unnecessary wave advances into power amplifier by this.

[0003] By the way, in the above-mentioned isolator, depending on the frequency of the reflected wave b which advances from a port P2, it may be unable to absorb and the problem that a reflected wave b falls out in a port P1 as a result arises. In order to avoid such a problem, attaining wide band-ization of an isolation property (opposite direction damping property) is performed.

[0004] On the other hand, as shown in drawing 11, the matching circuit 1 which becomes each ports P1-P3 from L (inductance), C (capacitor), etc. is connected, and there is the method of extending the pass band width of each ports P1-P3 by this. However, when matching circuits 1 and 1 are formed on the line of the ports P1 and P2 through which a signal passes, only the part whose part mark loss increases, and has the problem that an I.L. property (passage property) deteriorates, and increase has the problem of causing enlargement of parts, and increase-ization of a weight.

[0005] On the other hand, as shown in drawing 10, a matching circuit 1 is formed between the terminator machine R and a port P3 (refer to drawing 10 (a)) or between the terminator machine R and a cold end (refer to drawing 10 (b)), and it is possible that this wide-band-izes only an isolation property. When it does in this way, while being able to make loss by the signal line small and being able to avoid degradation of an I.L. property, only the part which can cut down part mark can respond to a miniaturization and lightweight-ization.

[0006] Here, what is shown in drawing 5 or drawing 9 can be considered as an example of 1 structure in the case of giving a matching circuit to the above-mentioned terminator machine. This isolator 2 makes a grounded plate 17 intervene in the main part 3 of a magnetic-substance yoke which mainly forms a magnetic closed circuit, and 4, carries out hold arrangement of the capacity substrate 5 for adjustment, and the ferrite device 6, and the terminal substrate 8 is arranged in the exterior of the above-mentioned yoke 4, and it is constituted while impressing a direct-current magnetic field to a ferrite device 6 with the permanent magnet 7 stuck on the inside of the above-mentioned yoke 3.

[0007] And drawing 5 and drawing 6 are the example which connected the other end to the above-mentioned yoke 4 while they constitute the matching circuit element 11 from a coil 9 and a disk type capacitor 10 and connect the end of this circuit element 11 to terminator film 5a of the above-mentioned capacity substrate 5.

[0008] Moreover, they are the example which connected other end 13b to the above-mentioned yoke 3 through the through hole electrode while drawing 7 and drawing 8 carry out pattern formation of the microstrip line 13 to the front face of a substrate 12, constitute the matching circuit substrate 14, carry this circuit board 14 in the upper part of a yoke 3 and connect end 13a of the above-mentioned microstrip line 13, and terminator film 5a of the capacity substrate 5 through a metal plate 15. Furthermore, drawing 9 is the example which constituted the matching circuit substrate 16 for the substrate in which the stripline which is not illustrated was formed in piles, and carried this substrate 16 in the upper part of a yoke 3.

[0009]

[Problem(s) to be Solved by the Invention] However, in each above-mentioned example of structure, since it is the structure of carrying a matching circuit element and a matching circuit substrate in the main part of a yoke separately, enlargement of parts and increase-ization of a weight are not avoided, but a problem that it cannot respond to a miniaturization and lightweight-ization is at the an advantage, and the improvement at this point is demanded.

[0010] Moreover, when the matching circuit element by the above-mentioned coil and the disk capacitor is adopted, a constant tends to become unstable, and since adjustment of the electrical property which time and effort requires for this reason is needed, there is a problem that cost goes up.

[0011] this invention aims at offering the non-reciprocal circuit element which can respond to the miniaturization of parts, and lightweight-ization, and simplifies adjustment of an electrical property, and can reduce cost, having been made in view of the above-mentioned actual condition, and attaining wide band-ization of isolation.

[0012]

[Means for Solving the Problem] this invention is in an electric insulation state mutually about the central conductor of plurality [ferrite / to which a direct-current magnetic field is impressed]. And make it cross, arrange and a termination machine is connected to any one port of the above-mentioned central conductor. It is the non-reciprocal circuit element for which a matching circuit is connected to this termination machine, and only the isolation property attained wide band-ization. This track is formed in the above-mentioned matching circuit as a stripline at the sheet metal substrate, using the track where electric length becomes the integral multiple of 1/4, and lambdag, and it is characterized by the ground plane of this sheet metal substrate serving as the grounded plate of this non-reciprocal circuit element further.

[0013]

[Function] Wide band-ization of an isolation property can be attained avoiding the influence on an I.L. property, since according to the non-reciprocal circuit element concerning this invention pattern formation of the stripline which has the electric length of 1/4, and lambdag was carried out to the sheet metal substrate and the ground plane of this sheet metal substrate was made to serve a double purpose as a grounded plate, a reflected wave is absorbed certainly, and penetration of an unnecessary wave can be prevented.

[0014] Moreover, since the above-mentioned sheet metal substrate was made to serve a double purpose as a grounded plate and the existing substrate can be used as it is, the size of parts, capacity, and a weight do not almost increase. Therefore, compared with the case where an above-mentioned matching circuit element and an above-mentioned matching circuit substrate are carried separately, it can respond to the miniaturization of parts, and lightweight-ization.

[0015] Furthermore, since what is necessary is just to manage the track length of the above-mentioned stripline, compared with the case where the circuit element by the above-mentioned coil and the disk capacitor is used, a highly precise wide band-ized circuit with little dispersion can consist of this inventions. In connection with this, simplification of electric adjustment or no adjusting-ization can be attained, as a result cost can be reduced, and it can contribute to low-pricing of parts.

[0016]

[Example] Hereafter, the example of this invention is explained about drawing. Drawing 1' or drawing 4 is drawing for explaining the non-reciprocal circuit element by one example of this invention, and this example explains it taking the case of the case where it applies to a concentrated-constant type isolator.

[0017] In drawing, 20 is the concentrated-constant type isolator with which this example structure was applied. A ferrite device 24 is arranged, and this isolator 20 equips with the magnetic-substance metal top yoke 25 as well as the bottom yoke 22 of the above, it forms the magnetic circuit of a closed magnetic circuit, and is constituted while arranging the profile KO character-like lower yoke 22 of magnetic-substance metal, making the ground substrate 40 later mentioned on bottom wall 22a of this lower yoke 22 intervene and arranging the capacity substrate 23 for adjustment on the terminal substrate 21. Moreover, the permanent magnet 26 is stuck on the inside of the above top yoke 25, and it is constituted so that the direct-current magnetic field for bias may be impressed to the above-mentioned ferrite device 24 with this permanent magnet 26.

[0018] Ground electrode 36a is formed in the terminal substrate 21 above-mentioned upper surface, and the inferior surface of tongue of the lower yoke 22 is in contact with this ground electrode 36a. Moreover, the terminal electrodes 37a and 37b for a ground connected to the above-mentioned ground electrode 36a are formed in the upper surface and the inferior surface of tongue of a right-and-left unilateral marginal part of the above-mentioned terminal substrate 21, and this ends child electrode 37a and 37b are connected by the side electrode 38.

[0019] Moreover, the terminal electrodes 32a and 32b for I/O are formed in the upper surface and the inferior surface of tongue of the side edge section besides right and left of the above-mentioned terminal substrate 21, respectively, and this terminal electrode 32a and 32b are connected by the side electrode 39.

[0020] It really forms the reticulated 1st - the 3rd central conductor 27-29 in the disc-like shield section which is not illustrated, arranges a microwave ferrite 30 on the above-mentioned shield section, and the above-mentioned ferrite device 24 is in an electric insulation state mutually about each above-mentioned central conductors 27-29 on the upper

surface of this ferrite 30, and it is made across for every angle of 120 degrees, and has structure bent and arranged. Moreover, the external connections 27a-29a of each central conductors 27-29 were bent in the shape of a stage, were formed, and are projected to the method of outside.

[0021] the above-mentioned capacity substrate 23 for adjustment -- the center section of the dielectric substrate 31 -- insertion -- a hole -- 31a -- forming -- insertion of this substrate 31 upper surface -- a hole -- while forming the 1st - the 3rd capacitor electrodes C1-C3 in the periphery section of 31a by thick film screen printing, connection formation of the terminator film R is carried out by thick film screen printing, and it is constituted by this 3rd capacitor electrode C3

[0022] insertion of the above-mentioned capacity substrate 23 -- a hole -- into 31a, insertion arrangement of the ferrite device 24 is carried out, and, thereby, the inferior surface of tongue of the above-mentioned ferrite 30 is connected on bottom wall 22a of the lower yoke 22 through the shield section of each central conductors 27-29

[0023] Moreover, the external connections 27a-29a of each above-mentioned central conductors 27-29 are connected to each above-mentioned capacitor electrodes C1-C3, and the points 27b and 28b of the connections 27a and 28a of this 1st [the] and the 2nd central conductor 27 and 28 are further connected to the terminal electrodes 32a and 32b for I/O of the above-mentioned terminal substrate 21.

[0024] And as shown in drawing 1 and drawing 2, the above-mentioned ground substrate 40 carries out the laminating of the sheet metal substrates 33 and 34 which make the feature of this example, and is constituted.

[0025] The above-mentioned ground substrate 40 carried out the laminating of the grounded plate 34 of sheet metal to the upper part of the sheet metal substrate 33, thermocompression bonding of this was carried out, it was formed, and Heights 33a and 34a protrude at one in the unilateral marginal part of this sheet metal substrate 33 and a grounded plate 34. Moreover, pattern formation of the ground electrodes 41 and 42 is carried out to the upper surface of the above-mentioned grounded plate 33, and the inferior surface of tongue of the sheet metal substrate 33, respectively, and this electrode 41 and 42 comrades have countered on both sides of the sheet metal substrate 33.

[0026] Moreover, the abbreviation semicircle-like side through hole electrode 43 is formed in each ***** of the above-mentioned ground substrate 40, and both the above-mentioned ground electrode 41 and 42 comrades are connected by this side through hole electrode 43. Besides the inferior surface of tongue of the above-mentioned capacity substrate 23 is in contact with the ground electrode 41 of a field, and the ground electrode 42 of the above-mentioned inferior surface of tongue has contacted on bottom wall 22a of the lower yoke 22.

[0027] And pattern formation of the microstrip line 44 is carried out to the upper surface of the above-mentioned sheet metal substrate 33. This stripline 44 consists of a track where track length becomes the integral multiple of 1/4, and lambdag, and end 44a of this is connected to both the ground electrodes 41 and 42 through the side through hole electrode 43 of unilateral *** of this substrate 33.

[0028] Moreover, other end 44b of the above-mentioned stripline 44 is drawn by each heights 33a and 34a of the above-mentioned ground substrate 40 through the through hole electrode 45 by which penetration formation was carried out at the land electrode 46 of a grounded plate 34. The terminator film R of this land electrode 46 and the above-mentioned capacity substrate 23 is connected by the metal plate 47 which bent in the shape of a hook and was formed, and, thereby, the matching circuit for wide-band-izing of this example is constituted.

[0029] Next, the operation effect of this example is explained. Wide band-ization of an isolation property can be attained avoiding the influence on an I.L. property, since according to the isolator 20 of this example the microstrip line 42 which has the electric length of 1/4, and lambdag was formed in the sheet metal substrate 33, the laminating of this substrate 33 was carried out with the grounded plate 34 and the ground substrate 40 was constituted, a reflected wave can be absorbed certainly by this, and penetration of an unnecessary wave can be prevented. Incidentally by this example, a frequency band is expandable to a 1.5 - double-precision grade.

[0030] Moreover, in this example, since the sheet metal substrate 33 was built in the ground substrate 40 which constitutes the above-mentioned isolator 20 and it united with it, it can do almost similarly to the size of the grounded plate which was being used from the former, capacity, and a weight, and can respond to the miniaturization of parts, and lightweight-ization compared with the case where an above-mentioned matching circuit is carried separately.

[0031] And in this example, since the ground plane of a stripline 44 was made to serve a double purpose as a grounded plate, it can share between one part and can contribute to a miniaturization and lightweight-ization also from this point. Here, silver plating may be performed to both the above-mentioned ground electrodes 41 and 42, and when it does in this way, a property can be improved more.

[0032] Furthermore, since what is necessary is just to set up the track length of the above-mentioned stripline 44 so that it may become the above-mentioned electric merit, compared with the case where a matching circuit element is constituted from an above-mentioned concentrated constant, a highly precise wide band-ized circuit with little dispersion can consist of this examples. Simplification of electric adjustment or no adjusting-ization can be attained by this, as a result cost can be reduced, and it can contribute to low-pricing of parts.

[0033] In addition, although the above-mentioned example explained taking the case of the case where carried out

thermocompression bonding of the two sheet metal substrates 33 and 34, and a ground substrate is formed, this invention may carry out pattern formation of the electrode to a green sheet, may reapply calcinate this electrode and a green sheet, and may form a ground substrate.

[0034] Moreover, although the above-mentioned example explained to concentrated-constant type 3 port circulator taking the case of the isolator which comes to connect a termination machine, this invention is not restricted to this and, of course, can be applied also to the non-reciprocal circuit element of a distributed constant type or a waveguide type.

[0035] [Effect of the Invention] Since according to the non-reciprocal circuit element which starts this invention as mentioned above electric merit formed the stripline used as 1/4, and lambda in the sheet metal substrate and used the ground plane of this sheet metal substrate also [grounded plate / which constitutes this non-reciprocal circuit element], while being able to respond to the miniaturization of parts, and lightweight-ization, attaining wide band-ization of an isolation property, it is effective in the ability to contribute to low-pricing.

[Translation done.]